Senior Service College FELLOWSHIP PROJECT

PROGRAM MANAGEMENT CHALLENGES IN A JOINT SERVICE ENVIRONMENT

BY

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USAWC CLASS OF 2007

U.S. Army War College, Carlisle Barracks, PA 17013-5050

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
10-05-2007	Civilian Research Paper	14 August 06-10 May 07

4. TITLE AND SUBTITLE

Program Management Challenges in a Joint Service Environment

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

LTC(P) Dorothy E. Taneyhill, ARNG

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

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8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

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10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT

DISTRIBUTION A: Unlimited

13. SUPPLEMENTARY NOTES

The views of the academic research paper are those of the author and do not reflect the official policy of the U.S. Government, the Department of Defense, or any of its agencies.

14. ABSTRACT

This paper provides a comparative analysis concerning Joint Service Acquisition Programs and the challenges presented when one service is teamed with another service to acquire the same system design or modifications of the same design. The Interim Defense Acquisition Guidebook defines a Joint Program Management Office as any defense acquisition system, subsystem, component, or technology program that involves formal management or funding by more than one Department of Defense Component during any phase of a system's life cycle. This paper evaluates the characteristics of joint programs and the criteria which support the propensity for management, programming, funding, and execution challenges within these programs. A comparative analysis will take into account the political dynamics and rational for joint programs, as well as the federal policies which stipulate the current climate in support of joint defense procTurements. The parameters established by DoD Directive 5000.1, Defense Acquisition, 12 May 2003, clearly states a policy preference for joint development programs over component unique development programs. The defense acquisition community must continue to provide the warfighter with quality systems which take into account compatibility, interoperability, and integration with existing and future systems.

Concerns and open questions include:

- Planning and Executing Army joint acquisition programs;
- Current DoD acquisition system, meeting program challenges in the 21st century;
- Requirement to acquire viable systems in a joint environment, capable of meeting user needs for often different mission requirements;

The analysis addresses recent joint program initiatives and provides insight to current program pitfalls and future challenges concerning joint service acquisition programs.

Finally, this paper concludes with recommended solutions concerning future joint program initiatives and insight for program success.

15. SUBJECT TERMS

Joint Program Management, Acquisition Transformation and Reform, Acquisition Guidelines and Directives, Major Joint Program Challenges, Joint Capabilities Integration and Development System Analysis (JCIDS)

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
					LTC(P) Dorothy E. Taneyhill
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. TELEPHONE NUMBER** *(include area code)*
UNCLASSIFIED	UNCLASSIFED	UNCLASSIFED	UNCLASSIFIED	39	(256) 426-5514

USAWC CIVILIAN RESEARCH PROJECT

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ABSTRACT

AUTHOR: LTC Dorothy E. Taneyhill

TITLE: Program Management Challenges in a Joint Service Environment

FORMAT: Civilian Research Project

DATE: 10 May 2007 WORD COUNT: 12,431 PAGES: 39

CLASSIFICATION: Unclassified

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ACKNOWLEDGMENTS

I would like to extend a special thanks to the Institute for Advanced Technology; Mr. Bob Riffle, LTG (Ret) Paul Funk, Dr. Hans Mark, Ph.D., and my fellow classmates, especially COL Chuck Honore' and COL Lawrence Montgomery, for their guidance and mentorship over the course of this Fellowship. I also would like to thank the administrative support of Ms. Lorrie Mathey; the technical assistance of Vickie Grier and Sandra Spicher; and the research assistance of Mr. Noah Lowenstein and Mr. Mike Nomura. Without their patience and assistance, this paper would not have been possible.

Thanks to COL Shelley Yarborough, Mr. John Caraway, and CW5 (Ret) Mike Kather from the Program Executive Office (PEO) Aviation, Redstone Arsenal, AL, for providing insight and sharing their invaluable experiences in support of this project.

To the all of the men and women who serve in our Armed Forces, I acknowledge their contributions and sacrifice. In return for their service, they deserve ready access to the very best systems and equipment available to support them. The Acquisition Corps will continue to meet the challenges associated with ensuring that quality systems are fielded on schedule and that these systems achieve or exceed the intended mission requirements. Our warfighters must be assured they will be provided the most up to date technology and capable systems available to assist them with accomplishing their mission.

This paper is the result of the author's Army War College Fellowship at the Institute for Advanced Technology at The University of Texas at Austin.

PROGRAM MANAGEMENT CHALLENGES IN A JOINT SERVICE ENVIRONMENT

Introduction

Declining defense budgets have forced us to explore new ways of fielding technologies more cost effectively and expeditiously to the military services; however, rigid rules and regulations do not always permit efficient and timely fielding of new systems to the battlefield.

Recent conflicts over the past five years have clearly demonstrated the incentive for joint acquisition program initiatives. Operations Enduring Freedom and Iraqi Freedom are reminders that the best systems that support our warfighters must be made available expeditiously and utilizing the most cost effective measures possible. Shrinking budgets have forced "doing more with less". This has resulted in the DoD acquisition community restructuring their approach, and implementing a joint service approach when developing and fielding new systems. DoD organizations must continuously examine the most beneficial and cost effective ways to support the warfighter expeditiously and utilizing the most cost effective methods as possible. Joint staffs, military departments and defense agencies have the challenge to fulfill the defense acquisition reform and streamlining initiatives; to employ the use of best practices, and utilize the most responsive developer in terms of best value and services that will meet the needs of the warfighter. In order to ensure this process is harmonious, the move towards joint programs which jointly share and manage development costs, testing, production and fielding of the system have become more prominent within the DoD acquisition community in the past decade. It is clear that DoD is committed to achieving acquisition reform initiatives in support of the goal to consolidate efforts, unify similar requirements and jointly produce a system that can jointly meet the mission requirements of more than one military service. While the idea that greater efficiencies can be obtained through the efforts of joint program initiatives, taking into account costs as an independent variable (CAIV), does not always consider funding inequalities that exist among the separate services. The challenge which results from joint programs initiatives is that the services are not always efficient at defining the mission requirements or determining how the system must perform over the course of its entire life cycle. Differences in mission requirements, both operationally and strategically, causes program delays which deviate from the intended joint acquisition process; which is to field the best system possible, in the shortest amount of time, for

the best value, and that the system will meet the objective as intended by two or more services. This challenge continues as the joint service programs strive to follow the guidance and reform legislation as stated in DoD 5000 and the Federal Streamlining Act of 1994 (FASA), public law 103-355. This paper analyzes these challenges which permeates and at times impedes the goal of joint service acquisition programs [1].

Acquisition Reform

> "There is a growing and deep concern within Congress and the Department of Defense (DoD) Leadership Team about the DoD Acquisition Process. Many programs continue to increase in cost and schedule even after multiple studies and recommendations that span past fifteen years. In addition, the DoD Inspector General has recently raised various acquisition management shortcomings…" [2].

During June 1986, the President commissioned a body of experts which became known as the Packard Commission. The purpose of the Commission was to evaluate and make reservations for improving the defense acquisition system. The findings of the Commission determined that the current system was too bureaucratic, and over-regulated. Too many systems exist which cost too much, take too long to develop and by the time the systems were fielded, the technology was often obsolete. The acquisition process that was currently in place consisted of a ten to fifteen year cycle for major weapons systems. As a result of these findings, the Packard Commission directed closer cooperation between the services. While streamlining processes have evolved and improved over time, many processes remain complex and burdensome.

The Goldwater-Nichols Reorganization Act of 1996 mandated that the services be more "joint oriented" in terms of doctrine and requirements. One of the major tenets of this Act was to promote efficiencies and capitalize on joint technology integration and interoperability when services share similar system requirements. What remains problematic is that the DoD acquisition process is linked to the front end capability requirements determination process that directs what the military services are authorized to procure. When a joint service effort is added to this process, the issues become even more convoluted. Acquisition is linked to several resource allocation processes that fund all acquisition programs. Many of the problems that arise during the acquisition process come from these competing processes. To date, one of the biggest issues to consider is the requirements creep that occurs when two or more services are joined together to develop a common system platform. Military services that are joined together to form a partnership often experience severe differences in available funding to support the shared

acquisition. This requires the balancing and compromise and forces “trade-offs” between performance, cost, and schedule. In some instances, the lack of fiscal requirements foresight often creates funding instability. This in turn, results in often fierce competition for fiscal resources along with several other major priority programs [3].

One view is that the Goldwater-Nichols reforms were designed for a previous spending environment that was clearly out of control [4]. Notably, acquisition reforms were aimed to avoid the classic $600 toilet seats and $200 hammers that were prevalent spending practices during previous decades. Another precaution implemented from this act was precluding high production rates before the technologies have matured. The system must be proven capable and meet the mission needs of the joint service and the warfighter. Another initiative behind the Goldwater-Nichols reforms was the empowerment of the Chairman of the Joint Chiefs over the service chiefs and departments secretaries [5].

In order to promote positive changes and enhance the often laborious and cumbersome acquisition process, services should join together and generate joint requirements. In order to support this initiative, the creation of the Joint Requirements Oversight Council (JROC) was formed to monitor these joint service initiatives [6].

Acquisition reform was brought about in part to counter the exorbitant costs of goods and services which support DoD on a daily basis. After decades of purchasing overpriced supplies and fielding systems which do not fully meet the needs of our warfighters, a government wide team was formulated resulting in the Federal Streamlining Act of 1994. This was a historic landmark; enacting legislation which completely overhauled procedures and practices previously directed federal procurement law processes. Follow on initiatives continue with the implementation of additional acquisition reform proposals which target two critical areas: bid protest reform and competition streamlining [7].

DoD has recognized the impact of the administrative burdens that military services face when supporting the development and fielding of a system long term. As service budgets continue to face decline, processes are encouraged which include only allowing the best qualified offeror’s to compete; using only the number of offeror’s sufficient to ensure fair competition while maintaining efficiency when procuring high costs systems. While several legislative proposals have been implemented to address procurement best practices, joint acquisition programs struggle with the differences in funding profiles, differences in technical specifications

of the system, and the expected final product once the system has completed production. It is important to recognize DoD's attempt at summarizing this process while attempting to promote efficient processes.

Authorizing contracting officers to conduct a competition among those sources initially selected will permit more effective balancing of competition requirements with efficiency in the contracting process. Potential offerors will know early in the procurement if they do not have a likely chance for award, saving their time, money, and resources and those of the agencies. In addition, allowing agencies to limit the number of offerors in the competitive range to the number that will allow an efficient competition will enable agencies to expedite the procurement process, and will allow offerors not having a real chance to receive the award to save time and money by being removed sooner in the process. The final provisions of the FY 1996 National Defense Authorization Act authorized agencies to limit the competitive range [8].

While new legislation encourages streamlining; the bidding process, at times, is a feudal attempt because of opposing views concerning the optimal and expected outcome of the procured joint system. Often, attempts to expedite the acquisition processes by allowing only the most qualified competitors to submit proposals results in an untimely process. Requirements vary in scale and degree, eliminating many potential bidders which cannot adequately provide a system to meet multiple service requirements in the most expedient and cost effective method possible.

Acquisition reform is an important element of DoD's strategy to meet the requirements of the warfighter. The objective will continue to focus on buying smarter and faster while getting better products at the best price. Success is achieved through focusing on identifying and eliminating impediments to new and innovative business processes, as well as incorporating best practices already available from the marketplace and industry [9].

Following the Rules

Acquisition programs struggle to incorporate new and needed technologies into their pre-existing systems as modifications to these previously developed technologies are required. To achieve compliance, strict regulations and standards are in place and must be followed. Joint programs experience an often burdensome task, and are often forced to compromise regarding joint directives. One example of this is stipulated in DoD Directive 5000.1, which requires that every weapon system must conduct an environmental, safety, and health (ESH) analyses. This

ESH analysis must be initiated at the earliest possible time in the acquisition process and continually updated throughout the life cycle of the program. The program manager must recognize and understand the environmental issues that are important to the program and the public, and to develop strategies for integrating these ESH issues [10].

Commercial-Off-The-Shelf (COTS) Procurement Practices

New statutory requirements supporting Commercial-Off-The-Shelf (COTS) buying practices have moved to the forefront in recent years. The Federal Acquisition Regulation has substantially increased DoD's ability to acquire commercial items and components. While a new regulatory approach (within the FAR) includes an integrated approach to contracting for the acquisition of commercial items, the complexity of a COTS acquisition does not necessary reduce or minimize the acquisition processes when a major COTS system is being jointly procured. The FY 1996 Defense Authorization Act simplifies commercial item acquisition by authorizing, within a three year period, commercial buys up to $5 million in contract value to be purchased using far more simplified procurement procedures. The benefit that this act provides is the elimination of previously burdensome cost and pricing data from competitive commercial item procurements [11].

The goal of COTS acquisitions is to reduce Research and Development (R&D) Costs, System Development and Design (SD&D), shorten production schedules, and minimize demands on one services budget. This further supports one of the intended objectives of the trend towards "jointness" in major acquisition programs. The premise by sharing costs and leveraging pre-existing and future technologies across the services will save time, increase efficiencies, and ultimately promote significant cost savings.

Joint Testing Processes for Major Systems

Several advantages exist when joint programs share the often tedious and time consuming initiatives involved in testing a major system. In order to better streamline these processes, the Secretary of Defense has mandated the use of Integrated Product Teams (IPTs) consisting of all acquisition process stakeholders [12]. The intent is to establish successful acquisition programs which would identify, develop, and execute cost effective plans and strategies in a more structured and team oriented environment. Today, these concepts appear status quo but in reality, this strategy is a significant paradigm shift from previous prior practices. Identifying potential

problems through thorough testing, guarantees a higher degree of reliability and effectiveness as opposed to discovering glitches once the system has already been fielded.

The Federal Acquisition Streamlining Act of 1994 provides DoD with relief in several areas which applies to major systems. This act offers repeal with the former redundancy of competitive prototyping and competitive alternative sources requirements. Required documentation and reporting is also reduced as well as the removal of statutory detail which was previously required from multiple reporting procedures. The overall result is a shared streamlining of testing processes which includes alternatives for live-fire testing at the component, subsystem, and subassembly level [13].

Despite these initiatives which have substantially improved what was previously laborious, costly, and time consuming, the current mandated processes used today are not without turmoil. In many instances joint programs employ different testing objectives into each phase of the testing processes. Processes may differ from developmental testing through operational testing and eventually user testing. Because of these testing differences, ample challenges are presented along each phase. In order to more effectively deal with these challenges, joint programs must collectively initiate testing processes early on. Validating and identifying problem areas in advance and continually revising and re-evaluating testing processes are necessary. Joint programs will most likely continue to struggle with disparities when determining and completing required testing processes in accordance with the program schedule. Initiatives which promote a common objective early in the acquisition process are more likely to achieve success when it comes to testing practices.

The Importance of an Acquisition Strategy

The acquisition strategy consists of the elements which are the foundation for the acquisition process. The acquisition strategy initiates the conceptual plan that the program manager will follow in the execution of the acquisition program. This strategy is modified throughout the acquisition process and includes multiple factors. Some of these factors include proposed contracting administration processes and solicitation initiatives and guidelines for accepting or rejecting proposals. Life cycle costs are projected and test and evaluation criteria are outlined. Data rights, warranties and criteria that will be utilized to evaluate and analyze contractor and government risks are also addressed in the acquisition strategy. A well documented acquisition strategy will clearly define the activities that exist between the various

components of the joint program. Each service approaches the acquisition strategy from a different perspective. Despite these differences in approach, each services acquisition strategy must collectively address how the program will be managed over course of the program's life cycle [14].

To ensure success, all joint acquisition strategies must result from a collaborative effort. Early on in the process, development of the acquisition strategy must include close coordination among the Milestone Decision Authority (MDA), the program manager, and all of the functional communities that are stakeholders in supporting the acquisition. A strategy that is well defined will ultimately reduce the time and cost required to achieve an approved capability needs and maximize affordability throughout the program's life-cycle. In accordance with DoD Directive 5000.1, the program manager shall be the single point of accountability for accomplishing program objectives for total life-cycle systems management which also includes the sustainment phase [15].

While the program manager is chartered to tailor program planning to specific program needs, joint programs can become convoluted when two services have diametrically different planning objectives in an attempt to achieve a common system goal. In order to accomplish this in the most successful manner possible, the particular requirements of the program and most importantly, those requirements which differ by service, must be thoroughly analyzed. Multiple acquisition strategies must be considered when procuring any system. Joint acquisitions must take this process a step further, and ensure the strategy includes a viable approach which will satisfy the user needs of both services but also include an attainable strategy for interoperability and future technology integration. The acquisition strategy is a multiple step coordinated process that must be followed by the joint program stakeholders. For a program to receive approval to move forward, all steps must be thoroughly addressed and analyzed. The flow chart lists these principle considerations. It is critical that all joint programs ensure that communication is established early on and that these strategies can realistically be achieved according to the timeframe outlined by joint program directives. Table 1. depicts these principal considerations.

Table 1. Acquisition Strategy Considerations [16].

Acquisition Strategy Considerations	Acquisition Approach Best Practices	Modular Open Systems Approach
	Business Considerations	Product Support
	Capability Needs Summary	Program Structure
	Environmental, Safety, Occupational Health	Relief, Exemption, and Waiver
	Human Systems Integration Information Assurance	Research and Technology Protection
	Information Technology	Resource Management
	Integrated Test and Evaluation	Risk Management
	Integrated Test and Evaluation	Systems Engineering
	Interoperability	

Without a clearly stated acquisition strategy, program direction in a joint environment will falter. In order to succeed, the Program Executive Officer (PEO) and the DoD component Acquisition Executive must concur before the final approval is made by the Milestone Decision Authority. Depending on the structure of the joint program, the relationship between the services and the decision concerning which service will be the lead, are important factors concerning an expeditious and non-contentious approved strategy. Consensus is not always easily achieved during the formulation of the acquisition strategy. Changes along the process promulgated by requirements not previously considered, often keep the program from moving forward.

Joint Program Definition

A primary tenet of a joint program is for two or more military services to formulate a team early on in the acquisition process and agree on a system's joint functional requirements, military capabilities, and operating requirements. Secondly, team throughout the system development process to procure the systems jointly while maintaining the feasibility necessary to modify the system as needed to fit the specific needs of each individual service. The partnership is intended to share commonality with the particular subsystems or parts of the total system. Exact systems and like requirements are rarely the case with joint programs. Success is not

always clearly defined and joint military effectiveness is often subject to dispute. Compatibility of the shared system and its components are not the only critical factors in terms of capitalizing on shared cost savings and technology interoperability. The actual timing of combined initiatives, from early development to fielding, and funding initiatives that are carefully designed and timely executed are key parameters which define success [16].

The redundancy and commonality with similar requirements will continue to drive joint service merging of future systems. These programs possess such high visibility that Congress or the Secretary of Defense usually mandates the requirement for these joint initiatives. In the past, different views involving technological improvement and interservice differences over requirements capability have played a major role in duplication and interoperability blunders among like systems. When this situation occurs, the feasibility of "jointness" should be scrutinized more carefully. A recent joint program includes Joint Cargo Aircraft (JCA); the Army was assigned as the lead service in partnership with the Air Force. The Air Force came on board after the Army expended a substantial amount of time on concept development and defining the requirements determination process. While there is proof that suggests costs savings can be achieved by a partnership, when involving a commercial-off-the-shelf solution, establishing a cohesive partnership while processes for an Army requirement were well underway was not without significant challenges. Differences in mission requirements, to include payload requirements for cargo and projected distances, must include buy-in and concurrence from the highest levels of both services and DoD.

Each military service views the mission needs of the common system in a manner which best represents their individual mission and performance objectives. One prevailing common occurrence is that the requirements analysis is often accomplished independently by each service, even though mission overlap may occur [17]. Identifying and addressing requirements variations early on are key important parameters to program success.

Several factors have significantly influenced the joint acquisition process in general. During 1984, statistics showed that joint programs increased to twenty-five percent of all major programs [18]. Reasons for this growing trend includes the demand for more joint warfighting capabilities based on significant changes to doctrine and force structure throughout the military. This is particularly evident within the Army's force structure where the Army's Force generation Model (ARFORGEN) has drastically impacted how we fight and sustain our forces. We can

expect the joint program trend to continue as congressional mandates for cost-effectiveness and greater efficiencies in military procurement remains in the forefront when procuring major systems.

Budget Disparities Among the Services

The allocation of Defense resources has remained relatively constant over time. The Army provides the largest number of forces in support of the war on terrorism yet receives the smallest share of programmed Defense resources. The Army is the most man power intensive out of all of the services and does not have the ability to reduce its manpower to offset rising costs. Consistent increases in costs do not alleviate the constant challenge to add soldiers and equipment to effectively man our force [19].

The majority of the Army's funds are for sustaining people, maintaining the infrastructure, and preparing key equipment for deployment in support of combat operations. The manpower costs in the Army which includes salaries for our soldiers and civilians and the labor cost incurred in labor and procurement incurs approximately 80 percent of the total Army budget [20]. The following chart depicts the funding allocation broken down by individual service.

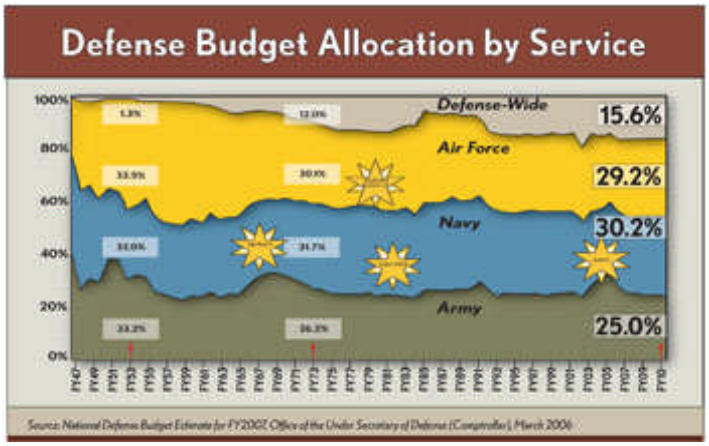

Figure 1. Defense Budget Allocation by Service [21].

During 1984, the Army dedicated approximately 31 percent of the budget in support procurement and research, development, test, and evaluation initiatives. By 2005, this funding was reduced to 17.5 percent. Rising manpower costs to attract and retain a quality force are factors causing reduced funding to support these required acquisition processes. The Army can

expect the challenges between supporting current requirements against future funding demands will continue [22].

Based on a $2.13 trillion deficit between FY 90 through FY 06, the Army's share is notably smaller than the other services. It is clearly noted that the Army receives approximately one-fifth of the investment dollars, while the Air Force and Navy receive approximately one-third. This funding decrement is a major factor in the Army's struggle to fund capabilities needed to support an ever increasing operational tempo (Optempo) and effectively prepare for emerging threats world-wide. The Army must rely on supplemental funding to replace critical weapons systems and lost or worn out battle damaged equipment that can not cost effectively be repaired. Supplemental funds have effectively sustained operations to continue the war on terrorism. Despite doing more with less, supplemental funds do not adequately support the necessary research and procurement required to keep pace with future capability based requirements [23].

The following chart depicts Defense spending trends by individual service.

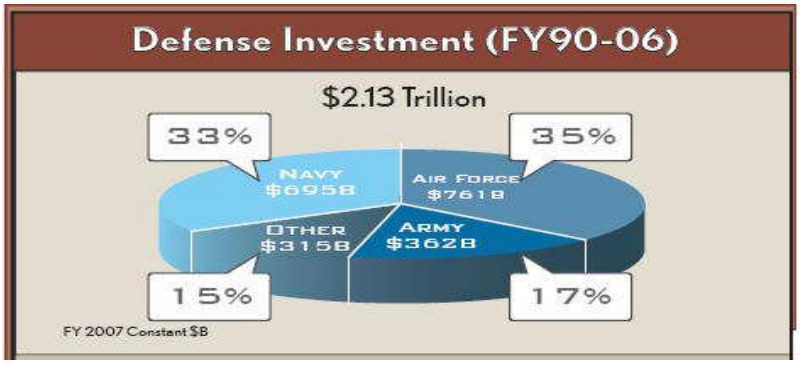

Figure 2. Defense Investment FY90-06 [24].

> "Continued support is needed to execute Army Business Transformation and achieve targeted efficiencies through: management reform; acquisition reform; comprehensive redesign of the organizations and business processes that generate, deploy, and reset forces; consolidation of bases and activities; military to civilian conversion programs, and performance measure enhancements"[25].

The Army's funding picture and the absence of required funding to meet future operational needs, is an example of the increased reliance on multiple services to develop, design, test, and field our systems. To meet the full spectrum of challenges and support a force which is powerful, flexible, and more deployable ever before, the Army must continue operating

in joint partnership with its sister services. There is simply not enough funding to adequately support all the capabilities that are needed throughout all services. Army procurement funding to support only priority acquisition programs can be expected to continue well into the future.

Joint Capabilities Integration and Development System Analysis Process (JCIDS)

The Joint Capabilities Integration and Development System (JCIDS) replaced the previous Requirements Generation System. The JCIDS process is a result of Secretary of Defense Donald H. Rumfeld's vision to transform DoD business practices and warfighting capabilities. JCIDS purpose is to foster efficiency, flexibility, creativity and innovation in the acquisition process. The goal will enable organizations to define their capability needs while still focusing on national strategy. Both operators and material developers will join together early in the acquisition process to identify solutions and resolve capability shortfalls more effectively. JCIDS is designed to provide the best systems and equipment that best achieves the needs of our future warfighters [26] .

The ability of DoD to conduct the large scale acquisitions required to ensure our future national security is a major concern to the committee. The rising costs and lengthening schedules of major defense acquisition programs lead to more expensive platforms fielded in fewer numbers. These concerns extend to all three critical components of the Acquisition process which includes requirements generation, acquisition and contracting, and financial management.

The purpose of the Joint Capabilities Integration and Development System (JCIDS) establishes policies and procedures to support the Chairman of the Joint Chiefs of Staff and the Joint Requirements Oversight Council (JROC) in identifying, assessing, and prioritizing joint military capability needs. JCIDS is intended to provide policy guidance to establish needed processes required for joint forces to meet the full range of military operations required in the future. DoD has implemented processes that will assess both existing and future capabilities in support future joint, allied, and coalition operations. JCIDS takes into account the full range of joint resources to include doctrine, organization, training, materiel, leadership, education, personnel, and facilities, and policy (DOTMLPF) [27].

The JCIDS process is an analysis based process that defines capability gaps, assesses capability needs and approaches to support a particular functional or operational area. Based on national defense policy and focused on a common joint warfighting concept, JCIDS analysis initiates the development of integrated, joint capabilities from existing joint force operations and

DOTMLPF capabilities and deficiencies. The JCIDS focus is based on joint future concepts and the resulting analysis formulates the foundation for future integrated architectures that will be developed to formulate solutions in support of capability needs.

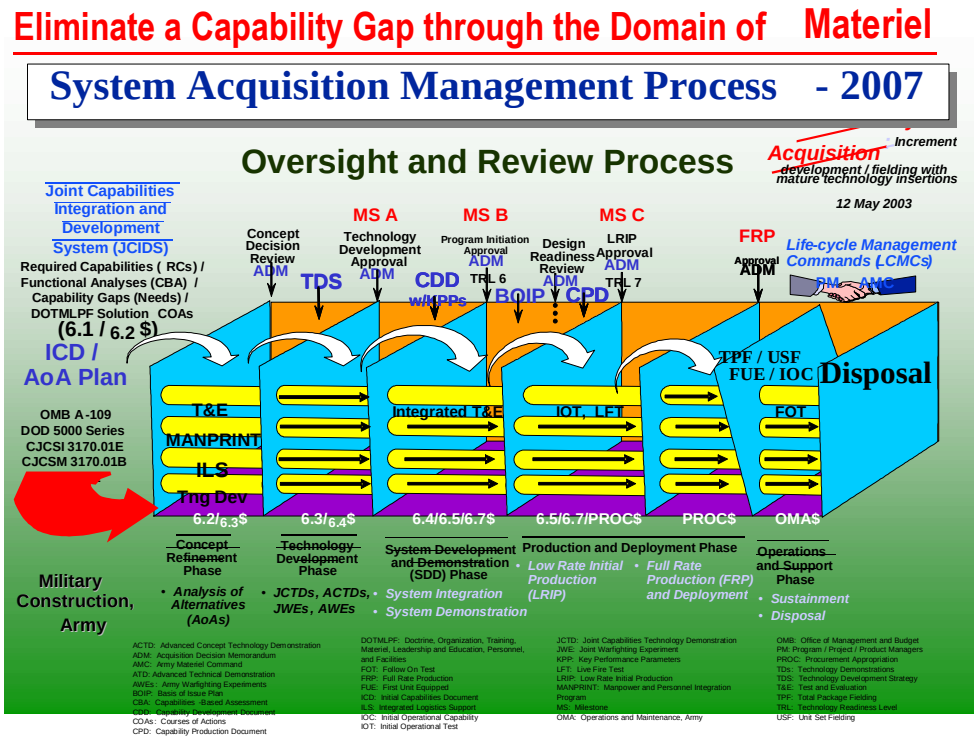

Figure 3. System Acquisition Management Process-2007 [28].

JCIDS begins with a Functional Area Analysis (FAA). The FAA results when a service submits and receives an approved concept of operations (CONOPS). The FAA can also be initiated at the Joint Requirements Oversight Council (JROC), if determined capabilities will have a significant impact on joint warfighting, or have a major impact across multiple services. The purpose of the FAA is to identify the operational tasks, conditions and standards necessary to achieve the desired military objectives. The FAA is an inclusive analysis comprised of joint future concepts, CONOPS, joint tasks, and the anticipated range of capabilities that may be employed in support of the full spectrum of operations. The FAA utilizes scenarios and assesses and analyzes the capabilities and attributes that are addressed in the approved CONOPS [29].

The Functional Needs Analysis (FNA) is the second step in the JCIDS analysis process. Typically, the combatant command or the Functional Capabilities Board (FCB), performs the FNA. To be successful, the FNA must include a coordinated joint effort among the combatant commands, the FCBs and other services which will be impacted by the capabilities that are undergoing analysis. The FNA applies the tasks that are identified in the FAA, and a list of capability gaps are produces with proposed solutions. These solutions are then assessed by priority and by timeframe in which they are required to meet the current or future capabilities that will be affected.

The FNA utilizes measures of effectiveness (MOEs) which include elements of time, distance, effects and obstacles that must be overcome to reach the desired capability. MOEs are key components that evaluate how well current or programmed capabilities are able to achieve the specified tasks initially outlined in the FAA. Once potential gaps are identified, and proposed solutions are identified, this analysis will support the development of key performance parameters (KPPs). Once the FNA is finalized, and if the capabilities described impact joint warfighting, the FNA may submit a Joint Capabilities Document to the JROC for validation and approval prior to the Functional Solution Analysis. This additional approval is determined through coordination with the related FCB prior to proceeding to the FSA [30].

The FSA is the third step of the JCIDS analysis process. The FSA is operationally based with input from the combatant commands and oversight by the FCBs. It assesses DOTMLPF and policy approaches and recommends solutions to mitigate the capability gaps that have been identified in the FNA. Integrated architectures are considered during the development of the FSA and approaches to resolve identified capability gaps are discussed. The purpose of the FNA is to identify possible ranges of both joint and independent solutions for resolving capability gaps.

The FSA decides what type of approach will fill the capability gaps that have been identified in the FNA. Either a non-materiel or integrated DOTMLPF approach can be considered to fill the capability gaps identified in the FNA. The analysis of materiel and non-materiel approaches (AMA) determines how well the approaches identified address the capability gaps and how the desired effects will be achieved. The AMA addresses operational risk with each approach and also considers the policy implications of each approach. Finally, the AMA will address the impact across the full spectrum of the system or system of systems to include supportability and sustainability factors. This includes the timeframe for delivery of the

capability to the warfighter in addition to evaluating when a new or increased capability could be delivered. Included in this analysis is the expected improvement in the capability desired, and the cost to develop, procure and sustain the new capability solutions versus the costs associated to sustain the current systems capability. The AMA also conducts examines market research and considers if commercial items or non-developmental items (NDI) are available to meet the desired capability [31].

The final step is the Post Independent Analysis (PIA). During this phase, the results of the FSA which include a thorough analysis of the non-materiel and materiel approaches are compiled and the appropriate recommendation is documented in the Initial Capabilities Document (ICD) or a joint DOTMLPF change recommendation (DCR) [32].

Based on the assessments at each stage of these steps, and should the approvals at each level be achieved, the result will transition into the appropriate level acquisition category (ACAT) program.

Tools for Joint Program Success

Dr Hans Mark, former Secretary of the Air Force, and current Professor, Engineering and Engineering Mechanics, the Institute for Advanced Technology, University of Texas at Austin, sheds an interesting perspective on this issue. Dr. Mark possesses over forty years of experience with a variety of technical military programs, several of these which were joint programs:

> "One of the very first factors that must be considered to achieve joint program success is to ensure that the technical performance of the system and the training of the system, mirrors as closely as possible, a real world combat scenario. Once the system is fielded, technical improvements and tested performance of these modifications must be made in the field and not in a makeshift, unrealistic training environment" [33].

All acquisition programs hinge upon multiple factors to ensure success is achieved. It is paramount that the program manager along with his or her staff forms a cohesive team to include technical, budget, contracting, and experienced support contractor personnel to minimize risk and keep the program on track and within budget. A joint program adds complexity to this process, adding additional management layers and levels of oversight which requires joint concurrence to move forward and achieve the next program milestone [34].

When services identify they share a common requirement, or if one service already has a program under development, another service can leverage off of this pre-existing technology, and utilize this technology in a positive way. Examples of this technology leveraging can be

drawn from rotary wing programs to include the Navy's Sea Hawk and the Army's Black Hawk rotary fleet. Although these programs are not joint by definition, reconfiguring similar systems to meet a separate and different material requirement can be positive initiatives in terms of saving OSD money and sharing among services the life cycle management for a common original equipment manufacturer (OEM) [35].

Smaller systems which are not considered major programs can bring on increased capability for an existing system. Programs such as Air Traffic Navigation, Integration and Coordination System (ATNAVICS), and Mobile Operations Tower Systems (MOTS), work well together when like requirements line up well, and the fielding requirements are closely aligned across the participating services [36].

The Army's initially called Future Cargo Aircraft (FCA), currently a joint venture with the Air Force and appropriately named Joint Cargo Aircraft (JCA) is an example of the Army's expertise in well defining the operational requirements for the Army mission. FCA from the time of program inception maintained a clear vision of program goals, requirements, and objectives [37].

The Joint Cruise Missile Program

The Joint Cruise Missile Program initiated in the late 1970's. Since then, DoD has made numerous attempts to provide the warfighter with an affordable standoff cruise missile that is capable of taking out the enemy's air defenses early on during a conflict.

The engine for this initial program was a joint acquisition which involved the Army, Navy, and Air Force. While the Cruise Missile engine was an adequately shared and common requirement among the three services, and did not present a challenge with fulfilling the technical requirements, the torpedo tubes brought about entirely different and unexpected challenges. The Navy had specific requirements for a twenty-two inch torpedo tube. Conversely, the Air Force had no requirement for a torpedo tube. The Army experienced challenges with the torpedo tube concerning weight specification requirements. These variations in service requirements resulted in the Cruise Missile Program splitting apart into each individual service. Although this was not a foreseeable intention at the onset of this program, the differences in service requirements for the Cruise Missile Program mandated a splitting off into each separate service in order to achieve success. This was one example of a critically important program that began jointly, but could not complete the acquisition jointly based on such a vast disparity within

each of the separate service's requirements. Despite this program split, after the program was far into development, the program overall was at the time, considered a success [38].

Since the joint cruise missile of the 1970's, one technology during the 1990's evolved into the current Joint Land Attack Cruise Missile Defense Elevated Netted Sensor (JLENS) program. A requirement for the JLENS emerged based on the joint services limited capability to defeat land attack cruise missiles. One pressing issue which led to the development of the JLENS was the need to detect and track lank attack cruise missiles based on the maximum range of our current joint service weapons systems. Detecting small targets at long ranges is difficult to accomplish. Land-based systems such as the Patriot, are typically limited to short range "pop-up" engagements and must collocate with the systems they are defending in order to achieve the necessary 360 degrees of defense protection [39].

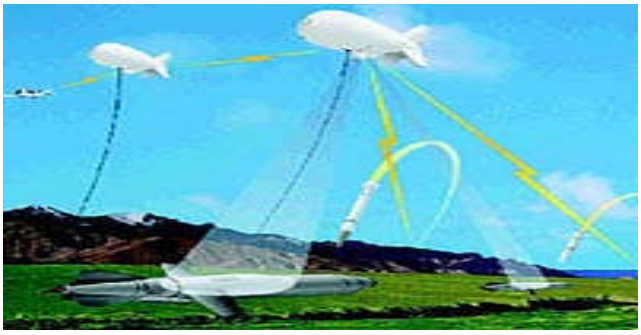

Figure 4. JLENS defeating land attack cruise missiles [40].

Resulting from an increased threat, Congress, OSD, the Joint Staff, and the Ballistic Missile Defense Organization, recognized that only a joint service solution would provide adequate force protection for our military forces. Based on this requirement, the Joint Staff, in consort with Congressional approval created the Joint Theater Air and Missile Defense Organization (JTAMDO) during March 1996. One of the main objectives of JTAMDO was to develop concepts in support of land attack cruise missile defense.

The JTAMDO operational vision includes the use of high tech surveillance and precision tracking sensors, while combining all surface and air based sensor data into one single integrated air picture. This integration will allow over-the-horizon (OTH) detection, classification, identification tracking, and engagement of threat land attack missiles. This new technology will create a new capability for each weapon system that is currently in the joint family of theater air

and missile defense. JLENS will achieve intercepts at the maximum effective kinematic range. This capability did not previously exist because of the sensor line-of-sight limitations created by terrain masking and curvature of the earth [41] .

The Joint Staff and OSD selected JLENS as a cost effective solution to defend against land attack cruise missiles. The Army was chosen as the lead service to develop the JLENS. The JLENS is a highly complex multi-component integrated system that will provide extended sensor range and intercept incoming cruise missiles at the first intercept opportunity, to include over enemy territory.

During January, 1998, the US Army Space and Missile Defense Command (SMDC) awarded the JLENS contract to Raytheon Company in Huntsville, AL. The objectives of the demonstration phase were to mitigate risks associated with the execution of the program; design, development, procurement, fabrication, integration, test, demonstration, and maintenance of a system which meets the performance specification; and development of an operational leave behind system for user evaluation and for use in the event of a contingency deployment. Several sub-contractors named to support JLENS are TRW, TCOM, L.P., Mercury Computer, and Hewlett Packard. The long term acquisition requirements are for 12 systems estimated at $1.6 billion [42].

To be a successful joint program, JLENS must meet the requirements and mission needs of the US Army, Navy, Air Force and Marines. JLENS is designed to operate at altitudes between 10,000 and 15,000 feet, detect long range terrain masked targets and provide an effective fire control solution for joint theater air and missile defense systems. JLENS will operate from land or sea locations, and can be quickly tactically relocated based on mission requirements [43]. Balancing technology innovations, managing requirements creep and maintaining program budget requirements in support of an engineering intensive system which will be used across the full spectrum of joint warfighting is a monumental task. The long term success of JLENS depend on its ability to accomplish its intended objective; deliver state of the art defense against land attack cruise missiles across a joint theater of operations. If current program milestones are achieved, JLENS will be implemented and prepared to counter the expected cruise missile threat by 2010.

The Tactical Fighter Experimental Program (TFX)

The F-111 A/B Tactical Fighter Experimental (TFX) program is one of the first historical examples of a joint program blunder. The F-111A was the Air Force version of the TFX and the F-111B was the Navy version. During the time of this program's inception, beginning in the early 1960's, then Defense Secretary Robert McNamara did not support the view to continue the acquisition of major systems as separate service development programs. Based on this view, Secretary McNamara was proactive in supporting joint service acquisitions whenever possible and practical to do so. The intent of the TFX program was to develop and procure a common fighter bomber aircraft platform in which the system design will meet the requirements of the Navy and the Air Force [44]. With this in mind, the goal at program inception was to achieve a successful "joint development" program. The TFX is considered one of the very first joint developmental programs for aircraft systems. This initiative was a robust undertaking not only because of the timeframe of its inception, during the early 1960s, but also considering the substantial technical challenges with two very different service performance requirements.

The following photograph depicted as figure 5, shows the F-111 TFX in flight during a live fire test.

Figure 5. F-111 Tactical Fighter Experimental (TFX) [45].

The F-111 TFX remains a historical example of a joint program with good intentions but fell critically short in several areas. This joint program with the Navy and Air Force was considered a successful acquisition in terms of meeting Air Force requirements; however, a failure for the Navy. Developing then modifying a common system design did not prove

effective. The Air Force required a robust aircraft which was capable of fulfilling a high priority requirement, which at the time was an aircraft capable of performing an interdiction mission. The Air Force required a long range aircraft and the weight and size of the F-111 did not present the same type of operational challenges to the Air Force as it did to the Navy. This fighter aircraft was too large and too heavy to effectively operate within the landing parameters required for aircraft carriers. Secretary McNamara's vision of this joint acquisition system was to fill a needed requirement for both the Navy and the Air Force. At the onset of this acquisition, decision makers at the highest levels in DoD did not foresee the technical and operational disparities that were prevalent soon after the system was in development. Secretary McNamara envisioned a successful joint program despite clearly different mission requirements; fleet air defense for the Navy and long range interdiction for the Air Force. The thought was a one common aircraft would be developed which would adequately fulfill both the aerodynamic and operational requirements of both services [46].

The F-111 is an example of a joint program that initially did not function cohesively from the efforts of top down management and oversight. The TFX began the source selection phase during 1961. The requirements for the F-111 program were established by Secretary McNamara. After convening for nearly one year, the board awarded the development contract to Boeing. Secretary McNamara overturned the source selection board's decision and awarded the contract to General Dynamics [47].

System modifications were incorporated to fix problems that were identified in the Navy's F-111B aircraft during numerous test flights which spanned over a two period from 1965 through 1967. These improvements were not adequate to fulfill the Navy's intended performance parameters. As a result, the Navy requested delaying the program and re-assess the possibility of a new aircraft design. Secretary McNamara non-concurred, stating that a new design would defeat the goal of a common system platform and the intended cost savings, would be substantially less [48]. The F-111 program could never completely recover and remain on schedule. During that period, the inability of current day technology, could not adequately achieve the "joint" intent of the program.

Doctrinal changes during the Vietnam War suggested that the F-111 would not meet the emerging requirements that an aircraft must be capable of close air combat. This view was

shared by both the Navy and the Air Force. It was clear that the current design of the F-111 would not meet this objective.

The F-111B experienced numerous specification changes during development. The Navy officially accepted the aircraft in 1967. Surprisingly, Congress did not support continued funding for the F-111 program and as a result, cut funding for the program during 1966 and again in 1967. Despite these cuts, the program during this period was not cancelled, primarily because there was no other materiel solution for a fleet defense aircraft [49].

The F-111 program survived budget cuts and was followed by the Navy's inception of the VFAX program; a development program developed to study aircraft designs against current world threat. The VFAX program determined that an aircraft was required that could achieve both air superiority and attack. In addition, the aircraft should be able to carry the Phoenix missile while simultaneously maintaining the ability to achieve close air combat [50].

In 1968, DoD recommended to Congress that funding efforts should be shifted towards the VFAX design. Based on this recommendation, the planned procurement of 30, F-111B aircraft was reduced to 8 aircraft during 1969. The Navy strongly asserted that the VFAX would fill the requirement for the new emerging fleet defense requirement; and therefore would be a desirable choice over the F-111B design. Finally, in 1968, and after Secretary of Defense Robert McNamara left office, Congress accepted the Senate Committee on Armed Services vote to cancel the F-111B. The VFAX program continued and the new system design resulted in the F-14 aircraft [51].

The Air Force version the F-111A was not without its share of performance challenges. Cost over-runs, program delays, and system upgrades were on-going even during full rate production in 1967. Despite these challenges, the Air Force continued with production. The end result of the F-111A was a total acquisition of 513 aircraft consisting of various models [52]. Despite a multitude of program challenges along the way, the TFX was considered a success for the Air Force. Similar to the Navy, the Air Force launched the FX program resulting in the F-15 aircraft.

Several lessons are learned from this historical joint program. First, the available technology during that time did not meet the requirements for a common and successful joint aircraft system. Modifications and upgrades were still being implemented even during full rate production. Discrepancies regarding a viable and achievable acquisition strategy were evident

throughout the program. Critical technologies that were required to keep the program on schedule and within budget were not ready for implementation when required.

The Navy's apparent concern regarding this joint initiative was evident. Despite modifications and design changes, the Navy did not have a high level of confidence that the F-111A would be capable of fulfilling the intended mission requirements.

The Secretary of Defense holds the authority to designate requirements for acquisition programs. At times this authority does not always coincide with the intended mission and performance related requirements of the participating services. In order to achieve success, current war fighting doctrine of the participating services, future required system capability and available interoperable technologies must be considered during all facets of the program.

Robert Coulam's analysis concerning the TFX in his 1977 publication "Illusions of Choice," reminds us of several key principals of success that apply if any joint program will be successful [53]. Coulam asserts that joint war fighting doctrine must be clearly understood by the participating services. This factor will impact the outcome and eventual success of operational testing. Additionally, the Office of the Secretary of Defense (OSD) must be supportive, proactive, and up to date with all joint programmatic initiatives, and thoroughly involved in the management of such a comprehensive program.

Joint Cargo Aircraft (JCA)

A current joint acquisition is the Army and Air Force Joint Cargo Aircraft (JCA); a combined effort to procure an aircraft that will meet the required warfighting capabilities of two very different services. It is interesting to note that research suggests that the vast majority of past and future challenges with joint program initiatives deal with aircraft systems. In part, this can be attributed to the significant cost drivers of these complex systems to include the development, operation, and life cycle sustainment costs required of these major systems.

The potential for contentiousness among the Army and Air Force leveraging for the fixed wing mission dates back over a half century when the Army and Air Force split off into separate services. With the onset of the Cold War during 1948 and the subsequent Key West agreement, the majority of the fixed wing missions were given to the Air Force, while the Army was assigned to defining the roles of the helicopter [54].

The legacy C-23 aircraft depicted below has been in the Army's force structure for approximately 30 years. The aircraft is unpressurized and has limited weight and cargo carrying capability.

Figure 6. Army C-23 Sherpa [55].

With the conflicts in Iraq and Afghanistan now into the 5th year, the services lines of delineation in terms of mission responsibility is not always clear. Advancements in technology to include emerging requirements such as unmanned aerial vehicles (UAVs), and the emerging requirements for state of the art technology have forced the overlap in mission requirements across the spectrum of military operations.

Joint Cargo Aircraft (JCA) began solely an Army only program formerly known as Future Cargo Aircraft (FCA). The FCA program was established to correct deficiencies in the legacy C-23 Sherpa aircraft, allow commonality with other aviation programs, and enhance future air cargo capability. The C-23 Sherpa is unique in that prior to Operation Iraqi Freedom and Operation Enduring Freedom, the C-23 was used primarily as a cargo carrying asset, owned and operated almost entirely by the Army National Guard. Since the beginning of the war on terrorism, the C-23 Sherpa has remained a critical resource, continuing to perform as an important component of the Army aviation fleet.

The FCA program entered the Concept Development (CD) phase during FY 2002. One of the CD phase objectives was to explore the alternatives available to meet future cargo mission requirements while maximizing capability within the context of the current and future force. The Army's intent of the Future Cargo Aircraft was to fulfill the inter-theater cargo operational shortfalls present in OIF and OEF and to fulfill projected future force cargo requirements [56].

Figure 6. C-27J Sparton Cargo Aircraft [57].

FCA was directed to implement a streamlined acquisition strategy. The FCA system would consist of a Commercial-Off-The-Shelf/Non-Developmental Item (COTS/NDI) solution. Some of the identified required subsystems include Aviation Survivability Equipment (ASE), and interoperable systems such as the Joint Tactical Radio System (JTRS). The solution designated that the FCA original equipment manufacturer (OEM) integrate ASE and JTRS during production. The intent was to incorporate a retrofit solution to integrate required subsystems, and associated processes during production. This streamlined acquisition strategy would provide the Army with the most cost efficient and timely approach with meeting the FCA mission requirement. Once the criteria had been identified for the Integration and Qualification phase, a successful Milestone C review would allow entrance into Full Rate Production.

The vision for the FCA program experienced a dramatic shift in program execution when a Program Decision Memorandum (PDM) was signed on 20 December 2005 [58]. The FCA program is unique in that the program was already in the Concept Development Phase three years prior to the decision made by the Acquisition Executive to form a Joint Program Office.

The program merge resulted in changing the joint program name to Joint Cargo Aircraft (JCA). The Army continued to refer to their aircraft system as FCA with the Air Force identifying their aircraft as Light Cargo Aircraft (LCA). The Army and the Air Force were directed to formulate a collaborative effort and present the plan to form a cohesive Joint Program Office (JPO) to the Under Secretary of Defense for Acquisition, Technology and Logistics by 28 February 2006.

Figure 7. Casa EADS C-295 Cargo Aircraft [59].

The Army's position was that the cost impact to the program was considered minimal, with each service funding their portion of the program. A key point discovered during research, was that the Air Force did not have funding programmed for the JCA program. However, despite this potential funding shortfall, an economy of scale savings in aircraft procurement was projected but remained unknown since the Air Force had not yet finalized their requirements, quantities of aircraft, or the schedule for fielding and implementation. Some increased costs were assumed due to potential schedule delays resulting from formulating a new Joint Program Office (JPO) [60].

With the addition of the Air Force promulgating new and unplanned requirements, schedule impacts to the program were expected. The USD(AT&L) delayed approving the Acquisition Strategy Report (ASR) until after the Army-Air Force MOU and JPO Charter was signed. The Army and Air Force met during January 2006 to develop the MOU and Charter. This delay impacted FCA from conducting source selection and subsequent contract award. The planned Milestone C, Defense Acquisition Board (DAB) was delayed from 4th quarter 2006 to 1st or 2nd quarter 2007. The DAB was rescheduled for 3rd quarter, 2007 [61].

The Army was designated as the lead for the joint program with a validated requirement for 145 cargo aircraft. The agreement was that the Army would not procure less than 64 cargo aircraft if the Air Force would assist in support of Army mission requirements. Two proven and capable aircraft are currently being considered to meet both the Army and Air Force mission. The main aircraft competitors to date are the EADS C-295 and the GMAS C-27J. The EADS aircraft have a proven track record with the U.S Coast Guard and are currently being utilized within 30 different military and government users in 24 countries. The C-27J is also a proven performer, currently being used in support of military operations in Greece and Italy [62].

DoD and the senior leaders of both services anticipate that the JCA partnership between with the Army and Air Force will be successful. Until the system is procured, fielded, and sustainment objectives are achieved, the long term success of this joint program is unknown. Despite an unprecedented teaming effort late in the acquisition, the JCA continues to move forward. The future of JCA will continue to evolve. Source selection is expected to be complete and the contract winner announced during May 2007.

Joint Tactical Radio System (JTRS)

The complexity of joint operations and the necessity to improve communications and information sharing among warfighters has resulted in a requirement for a series of software programmable radios. JTRS will become the primary means of wireless information transfer among mobile military users in the air, on the ground, and at sea [63]. The following graphic . depicts the first model of JTRS fielded.

Figure 8. The AN/PRC-148 JTRS Enhanced [64].

The JTRS program is managed by the JTRS Joint Program Office with the U.S. Army designated as the Service Acquisition Executive. JTRS is a joint program with the U.S. Air Force as the lead service and the U.S. Navy has program oversight. JTRS was initiated during 1997 in response to the services requiring a solution to a programmable, modular, multi-band, multi-mode radio that would replace over 200 different radio variations in the DoD inventory [65].

Once the system is fully operational, the goal of AMF JTRS Cluster 1 is to integrate multiple airborne, shipboard, and fixed-station platforms, enabling both maritime and airborne

forces to communicate with greater efficiency in a joint battlespace environment. AMF JTRS will be the first system of its kind, maintaining the ability to integrate an ad-hoc mobile wireless network consisting of both vehicular and airborne platforms using the Wideband Networking waveform (WNW). The acquisition requirements for JTRS are grouped into common clusters which are based on the commonality of requirements and the determined fielding schedules. Each cluster within the JTRS program is managed by a JTRS cluster project management office designated by the Under Secretary of Defense for Acquisition, Technology, and Logistics [66].

This program will attempt to overcome the challenges associated with multiple systems utilized by different services which are not compatible or interoperable. The limited bandwidth of these legacy components do not meet the requirements to operate efficiently and seamlessly in our fast paced and high tech joint operations environment. It is too soon to realize if the JTRS has reached its intended objective. During the time frame that this research was conducted, JTRS is projected to complete fielding during FY 2013.

Similar circumstances that surround mostly all joint programs to date can be anticipated. JTRS success will depend on its ability to integrate multiple and different communication requirements which vary greatly across services. One set of hardware coupled with multiple software applications which will have the ability to perform a variety of functions and communicate in multiple modes across a large frequency spectrum. This is a monumental task to design and integrate a radio platform that can meet current communication requirements across multiple services.

The JTRS joint program office has a team of multiple contractors and sub-contractors leading the charge for this very complex communication acquisition. DoD has designated Boeing as the prime system integrator for the JTRS acquisition. As the prime, Boeing is responsible for program management, systems and software engineering, network architecture development, airborne platform integration and integrated logistics support. Rockwell and Harris are separate contractors which are responsible for the development of the joint tactical radio and all of the required ancillary items. Some of the responsibilities of Rockwell and Harris overlap. Both Rockwell and Harris are responsible for radio design and platform integration activities. In addition, Rockwell is responsible for fixed site radio integration and Harris is responsible for information assurance, and maritime radio system integration. A separate contractor, L-3, is designated responsibility for maritime platform integration, control and management subsystem,

and managing the particulars of specific airborne integration and airborne network support. An additional contractor, Northrop Grumman will be responsible for the overall network management [67].

Once fielded, JTRS will represent a revolutionary approach to communications across the spectrum of the joint battlefield. JTRS is anticipated to drastically enhance the current ability to communicate operationally and assist commanders with expedient information needed to make tactical decisions rapidly. Processes required to keep a highly complex joint program on track coupled with multiple contractors performing both similar and very different responsibilities will be a challenge. This further supports the premise that strong management oversight and leadership for program success is essential. Often the lines between different contractors can become blurred if definitive government guidance and accurate and timely direction is not provided. Our leaders within our program offices face a daunting task when it comes to keeping the joint services in agreement concerning system requirements and at the same time keeping the program moving forward and on schedule. This responsibility, coupled with a program having multiple contractors, in addition to individual "clusters" that are managed by separate program offices will require a continuous, unified and carefully monitored joint effort on behalf of the services and the contractors. JTRS technology is expected to complete integration and be prepared for fielding during 2013 timeframe.

Forecasting Future Success from Lessons Learned

There are several programs where valuable lessons can be learned and applied to future joint systems that will be procured in the future. This research focused on three programs in particular, each program was designated by a separate as the joint program lead for a major system. The following listed programs have encountered unique and complex challenges.

Aerial Common Sensor (ACS)

Aerial Common Sensor (ACS) was a new development program designed to replace the Army's outdated Guardrail and Aerial Reconnaissance Low (ARL) intelligence gathering aircraft. Program was a joint interest with the Navy with the Army as the lead. The ACS program was a Systems Development and Demonstration (SDD) program with the goal was to purchase 38 aircraft for the Army and 18 for the Navy [68]. The Navy entered the program late in the process prior to the SDD Phase. The selected Embraer 145 aircraft was not robust enough to

meet the altitude and weight requirements needed to support the Army's mission. Added to this program's complexity were Navy requirements that were very different from the requirements originally specified by the Army. The Navy required the aircraft later in the fielding cycle and was not adequately funded at the time the joint partnership occurred. The ACS program empowered the contractor to choose the ACS platform. This caused multiple unexpected blunders that could not effectively or efficiently be resolved.

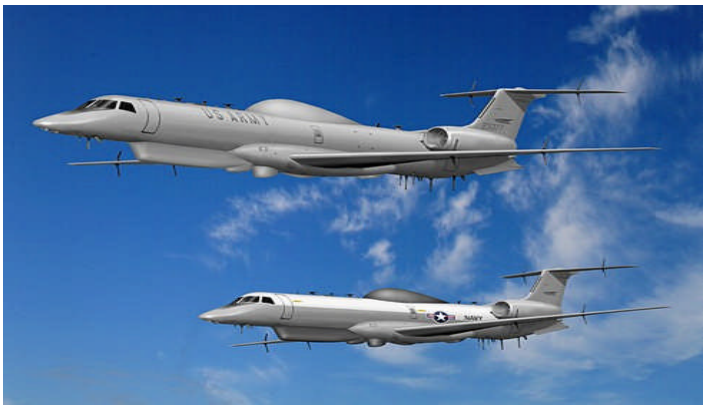

Figure 9. Army and Navy Aerial Common Sensor (ACS) [69].

The army terminated the Aerial Common Sensor contract with Lockheed Martin, Integrated Systems and Solutions, headquartered in Littleton, Colorado, for convenience. The contract awarded in August, 2004, was a Systems Development and Demonstration Contract (SDD). The contract was in a stop work status since 14 September 2005 when the Army allowed Lockheed 60 days to provide alternative options to resolve ongoing issues with program requirements. Lockheed did propose two options; keep the current aircraft and accept a significant reduction in performance capability, or switch to a larger more capable aircraft that would result in more than doubling the development costs. The Army did not accept either proposal [70].

The army notified the Office of Secretary of Defense (OSD), during summer 2005, that the weight of the systems payload would exceed the performance capabilities of the airframe. Lockheed attempted to mitigate the problems and prevent future problems but were unable to do so. The stop work was put in place to allow adequate time to identify problems and hopefully save the contract [71].

The Honorable Claude M. Bolton, Assistant Secretary of the Army, Acquisition, Logistics, and Technology (AL&T) briefed the ACS program to the Subcommittee on Tactical Air and Land Forces and the House Permanent Select Committee on Intelligence, United States House of Representatives on 20 October 2005. Assistant Secretary Bolton's briefing concluded that the ACS remains a valid requirement for the Army and the Navy. The Army launched a 6 month study during January 2006 to determine the correct mix of manned and unmanned systems across the services that would meet DoD's future airborne intelligence, surveillance, and reconnaissance (ISR) aircraft [72].

This delay has caused the current fleet consisting of the Guardrail common sensor and aerial reconnaissance to remain in the force structure longer than anticipated. These systems are currently undergoing modernization upgrades to keep the fleet safe and operationally ready. Both of these systems are critical assets to the Army's ISR fleet [73].

The ACS program did not experience a permanent cancellation; the program plan is to essentially started over and put a new strategy in place. A cohesive partnership between PEO, Aviation and PEO, Intelligence, and Electronic Warfare Systems (IEW&S) have joined together a team of subject matter expects to identify requirements and ensure the correct aircraft is selected. The program initiated a restart during 3rd quarter FY 2007.

V-22 Osprey

The V-22 Osprey Tilt-Rotor Aircraft program spent over 20 years in development. This program has received its share of critics, plagued with safety and maintenance concerns throughout its stages of development. The V-22 is the Marine Corps' top aviation priority. The intent of this aircraft was to provide an unprecedented capability to quickly and decisively project power from well over the horizon. The program throughout development encountered multiple setbacks to include affordability, safety, and program management. The V-22 is intended to perform both Marine Corps and Air Force missions. This includes troop and equipment transport, amphibious assault, search and rescue, and special operations. The Air Force's CV-22 version will be used for special operations and the Navy has also expressed a joint interest in the Osprey [74].

Figure 10. V-22 Osprey [75].

The aircraft was developed by Bell Helicopter Textron, powered by two turbine shaft engines built by a subsidiary of Rolls-Royce North America. The V-22 program was approved $18.1billion in funding through FY2005. The estimated cost for 458 aircraft was estimated at $50.5 billion. This cost breakdown equals an expensive aircraft, at $110 million per Osprey [76].

During June 2005, the Osprey MV-22 program completed its second round of testing. Operational evaluations and Navy testers recommended that DoD declare the aircraft operationally unsuitable and not effective for military use. DoD's Director of Operational Test and Evaluation and the Defense Acquisition Board (DAB) was required to review the Osprey before full-rate production could begin [77].

The Osprey acquisition did persevere despite two prototype crashes during 1989. Operational evaluation testing began during FY 2000. The Navy then identified that the MV-22 was operationally effective and suitable for land-based operations. Subsequent, the Marine Corps the Osprey was deemed operationally effective and suitable for both land and sea operations.

Despite accusations with maintenance related issues and parts fabrications, the Osprey continues with its production plan, cutting only 22 aircraft from the initial production schedule between FY2006 and FY 2009 [78].

F-35 Joint Strike Fighter (JSF)

The challenges with joint programs are not limited to disparities among the U.S. sister services. The JSF was established as an international program involving the United States and eight partner countries. The JSF was designed to be a low cost replacement to the Air Force's F-16, with different versions being developed for the Navy, Marine Corps, and British Forces. The program's expectations were to benefit the U.S. by reducing its share of program costs,

providing access to foreign industrial capabilities, and improve interoperability with allied militaries. In turn, partner governments expected to leverage off of previous available technologies, improve relationships with U.S. aerospace companies, and access JSF program data [79] . The following graphic at Figure 11 depicts a fully operational and fielded JSF.

Figure 11. F-35 Lightning II Joint Strike Fighter [80].

The Lockheed Martin F-35 Lightning II is a major multinational program intended to produce an affordable, multi-role strike fighter containing three variants. The F-35A conventional version for the US Air Force, the F-35B Short Take-Off, Vertical Landing for the Marines and the British Royal Navy, and the F-35C conventional carrier-launched version for the US Navy. System development partners include Britain, Italy, the Netherlands, Australia, Canada, Denmark, Norway, and Turkey [81].

JSF is an example of a costly international partnership, with estimated program costs exceeding $250 billion. The US government has committed to spend at least $16 billion just to replace the ageing F-111 fleet. International partners have the option to choose to assist with future program costs increases associated with the JSF. Under the terms of negotiated agreements, they are not obligated to do so. The burden of any unforeseen increases in program costs rests primarily on the United States [82].

Technology transfers for such a complex system are also problematic. Numerous export authorizations are required to share project information and technical data, and solicit bids from partner suppliers. The transfer of sensitive U.S. technologies is essential in order to leverage common systems technologies and achieve aircraft commonality goals. These issues maintain the

propensity to push the U.S. past the comfort zone due to sensitivities with disclosure policies. If not closely monitored, these actions often become more burdensome than initially intended, quickly escalating program costs and causing technology transfer initiatives to become unmanageable [83].

Joint acquisitions with partner countries are not without risk. If return-on-investment is not perceived as meeting the partnering countries expectations, support for the acquisition can quickly decline. JSF partner countries maintain an expectation to win JSF contacts through competition. These process deviates from typical cooperative programs which correlate contract awards to financial contributions. The JSF challenge will be to balance partner countries expectations with program costs, schedule, and performance goals. In the near term, the challenge is to agree on production phase arrangements and prepare for initial purchase commitments scheduled to begin during 2008-2009.

Recommendations

Joint programs are most successful when the ability is present to leverage the potential of rapid advancements within individual technologies and concurrently allow for changes within the program as these technologies evolve and mature. Programs which are evolutionary in design, maintain the foresight to mitigate technology challenges and plan accordingly in advance for required block improvements, fair better overall when it comes to successful program implementation and sustainment over the course of the systems life cycle.

The Army takes the lead when in comes to innovation and use of a Lead System Integrator (LSI). This initiative enables a “best of the best” approach for selection from competing industry efforts. Leveraging the best resources available to produce the best capability and value for the joint force has become the model for all major acquisition programs to follow. To date, this practice has proven successful and should be continued.

The key for ant successful program is the buy in and support of key leadership. This must occur jointly from program inception and continue throughout the systems development and fielding. Once fielded, planning must continue to support the system throughout its lifecycle. Service chiefs and key leaders must identify, support, and maintain the flexibility to effectively resource the joint program through adequate funding and sufficient personnel support. The levels of support and funding fluctuate for major programs and can deviate significantly on an

annual basis. Careful management is critical to avoid cost overruns and maintain cost, schedule, and performance parameters in accordance with contract objectives.

Conclusions

Shrinking budgets, coupled with the realization that conflicts of varying magnitude, will continue, is most likely an on-going reality. We must continue to explore measures which will efficiently and expediently field cost effective and quality systems to our warfighters. We can fully expect incentives for joint programs to continue. Significant changes in the Army's force structure alone in recent years, which include force modularity, necessitates that current combat operations provide our combatant commanders the means to execute expedient and timely decisions. In order to accomplish this, we must provide our warfighters the most current technologies available. The full spectrum of the battlefield has changed drastically, demanding a cohesive joint service team effort.

To achieve success in a joint service environment, we must continue to leverage best practices. We must jointly closely monitor costs, schedule and performance expectations. We can not afford that our programs undergo re-baselining because program requirements were initially unclear or because funding deficits forced program delays. We must continue to persevere as a joint team, identifying the requirements early on during Concept Development will minimize program delays later on. The common problems that cause delays and cost overruns can typically be attributed to "mission creep" requirements that surface during the SDD phase.

In recent years, our warfighters have experienced a drastic change in military business practices. One can conclude that joint programs which possess opposing or completely different requirements based on doctrine, coupled with conflicting and varied performance requirements will almost never ultimately achieve success.

Many reasons exist which support and substantiate the need for joint acquisition programs. The prevailing factors which support these programs are mainly tied to perceived DoD operational and economic advantages. The success of joint programs will continue to depend on the coordination of efforts among the joint services; the interoperability of parts and subsystems; measurable cost avoidance; reduction in logistics requirements; the commonality of requirements; measurable increases in military effectiveness; capitalizing on emerging technologies; and credibility as perceived by Congress and the taxpayer .

The current operations tempo suggests that joint acquisition efforts will continue. Defined mission requirements and adequate testing to ensure system reliability, must be followed by expediently fielding the most capable systems possible. Our warfighters deserve nothing less.

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